



PPE Ensembles

Angie M. Shepherd
William E. Haskell



National Institute for Occupational Safety and Health
National Personal Protective Technology Laboratory
PPT Stakeholder Meeting

March 2, 2010

PPE Ensemble

Multiple elements of protective clothing and equipment designed and configured as a set to provide limited protection in operational settings where exposure to hazards are expected



PPE Ensemble Elements

- Clothing
- Helmets
- Hearing protection
- Respirators
- Eye and face protection
- Gloves
- Footwear
- Interface components
- Communication and other electronic equipment



PPE Ensemble - History



- Protective clothing and equipment have primarily been manufactured, tested and certified as stand alone items
- Independent approach allows users to select the appropriate PPE for each situation or response
- Full ensemble consideration began with hazardous materials incidents
- Problems can arise when all components are worn together

Interoperability Concerns

- Interface areas
- Compatibility problems
- Ergonomics
- Weight
- Encapsulation
- Additional equipment (e.g. electronics/communication)
- After market add-ons or modifications



Standards Issues

- **Differing levels of requirements**
 - Clothing and respirator flammability
- **Tested and certified independently**
 - Allows users to select elements needed
- **Interference could void certification**
 - Suit could impact face seal negatively
- **Standard requirements could cause compatibility issues**



Sector Considerations

CBRN – Fire Service

Barrier protection

High visibility

PASS alarm

Integrated in or replaces gear



CBRN – Law Enforcement

Barrier protection

Stealth – low visibility/no sound

Ability to hold and fire weapon

In addition to regular gear



Emerging Trends - Standards



- **National Fire Protection Association (NFPA)**

- Hazardous Materials, Fire Fighter (CBRN), Tech Rescue (CBRN)

- **NIOSH Respirator Certifications**

- Reviewing PPE with the potential to negatively impact approved respiratory protection

- **ASTM International, F23 Committee on Protective Clothing and Equipment**

- Created new subcommittee F23.50 Certification and PPE Interoperability (Chair: Karen Lehtonen)



- **National Institute of Justice (NIJ)**

- CBRN Protective Ensembles for Law Enforcement Standard

Emerging Trends - Research

- **NIOSH NPPTL Research Areas**

- **Physiology** (Air-fed ensembles, first responder PPE)
- **Ergonomics** (First responder, healthcare, mine rescue PPE)
- **Evaluation and Development of Ensemble Tests**
 - Man-in-Simulant Test (MIST) – Oil of Wintergreen
 - Inward Leakage Test (ILT) – SF₆
 - Laboratory Respirator Protection Level (LRPL) – Corn Oil
 - Magnetic Passive Aerosol Sampler (MPAS) – Iron Particles

- **Posters presented in each of these areas**

- **Further discussion during Breakout Sessions 2 and 3**

Acknowledgements

Thank you!

Matt Collier, South Hills Area Council of Govts

John Gardell, Pittsburgh Bureau of Fire

Kelvin Jolly, Consol Energy Mine Rescue Team

Quality Partnerships Enhance Worker Safety & Health

Angie M. Shepherd

Email: AMShepherd@cdc.gov

Phone: 412-386-5245

William E. Haskell

Email: WHaskell@cdc.gov

Phone: 412-386-5245

www.cdc.gov/niosh/npptl/default.html

Disclaimer: The findings and conclusions in this presentation have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy.